CLAIMS OF THE INVENTION

I CLAIM

1. An apparatus for high-speed production of high quality laser-induced damage images comprising:
    - a pulsed laser for generating a high energy density laser beam to which the material is transparent;
    - a beam-splitter, a beam expander, transfer mirrors, a beam deflector;
    - means for creation of several separate breakdown centers inside each laser-induced damage;
    - means for creation of two laser beams directed inside the article from two mutually perpendicular directions;
    - means for creating the flat laser beam, allowing to control its thickness;
    - means for controlling longitudinal size of the laser-induced damage;
    - means for movement of a damage area inside the transparent material by successive displacement of the article (or the optical system) and by the deflection of laser beam inside the right space angle;
    - computer system, controlling the operation of the said devices.

2. The system in accordance with claim 1 wherein several separate breakdown centers inside each laser-induced damage created by using the computing phase hologram; the right phase structure of the computing phase hologram is calculated

so that the laser beam passing through the hologram is focused at several spots; these spots are located inside damage area and the distances between adjacent spots are larger than distance threshold d_0 (d_0 is a minimal distance which avoids an internal split between the separate small damages inside the damage area).

3. The system in accordance with claim 1 wherein each laser-induced damage is created in a result of intersection of two mutually perpendicular beams; the beams are generated by a beam-splitter, which divides the original beam into two beams; one of these beams is directed by the transfer mirrors to the optical system, which focuses it at the right point of the article; another beam is directed into the optical system, which transforms it into the flat beam; the said flat beam intersects the said focal spot of the first beam; the energy levels of these beams are controlled so that the breakdown is generated only at the intersection areas.

4. The system in accordance with claim 1 wherein controlling of longitudinal size of the laser-induced damage is produced by the optical system, which transforms the original beam in the flat beam and which can control its thickness; changing the thickness of the flat beam, the system produces damages of different longitudinal sizes.

5. The system in accordance with claim 1 wherein the laser-induced damage image is produced by division of the image on several areas, every of which contains the damages, which can be produced by deflection of laser beam; the focusing optical

system (or the computing phase hologram) is placed so that its optical axes passes through the center of the first area; all damages of the area are produced by deflection of the laser beam; after the damages of the first area have been created the article or the said optical system is shifted so that its optical axes passes through the center of the second area and so on.

6. The system in accordance with claim 1 wherein a laser-induced damage can be created with brightness, which changes its value depend upon the direction of observation; different brightness for different directions produced by simultaneous controlling the pulse energy of general laser beam and the thickness of the flat beam.